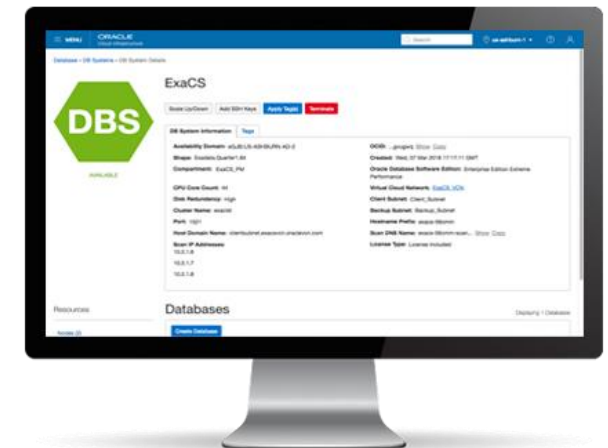


Oracle Database Cloud Services in OCI

Matthew Theodosdeau, Database Information Mgmt Systems
matt.theodoseau@oracle.com

The Best Database on the Best Cloud Platform

- Choose **Oracle Databases on VMs, Bare Metal, or Exadata, Oracle Cloud** provides the best infrastructure for running your database workload.
- **Cloud simplicity:** automated provisioning, maintenance, and elasticity
- **Built-in high availability and redundancy** provide a trusted platform for running enterprise, mission critical workloads
- **Security first:** encrypted databases, secure communications, and private networks by default
- **Flexible Subscription Options** to meet your Licensing needs
- **100% compatible with your on-premises Oracle workloads** and applications: seamlessly move between the two platforms



Available Cloud Database Shapes

Whether you choose Oracle Databases on VMs, bare metal, or Exadata, Oracle Cloud provides the best infrastructure for running your database workload. Utilize features found only in the Oracle Cloud such as RAC for High Availability, Data Guard for Disaster Recovery, and In-Memory Database for hyper fast analytics and reporting.



Exadata Cloud Service



**Bare Metal
Database Cloud Service**



**Virtual Machine
Database Cloud Service**

Available Cloud Database Shapes



Exadata Cloud Service

- Scale to 368 Cores with up to 5.7 TB of RAM
- Over 300 TB of NVMe Flash Cache Available
 - Up to 340 TB of Database Storage
 - 25 Gbps Network



Virtual Machine Database Cloud Service

- Scale from 1 to 48 Cores with up to 640 GB of RAM
- 256 GB - 40 TB remote NVMe SSD Block Volumes
- Standard or Enterprise Edition Oracle Databases
- Up to 25 GBps (for 24 core or 48 core shapes)



Bare Metal Database Cloud Service

- Scale from 2 to 52 Cores with 768 GB of RAM
- Up to 51.2 TB of local NVMe SSD Database Storage
- Standard or Enterprise Edition Oracle Databases
- 25 Gbps Network

Virtual Machine Database Cloud Service

Virtual Machine Database Cloud Service Overview

A full instance of Oracle running in the cloud

Full database instance
of Oracle

Choose from
Standard Edition or
Enterprise Editions

Highly available,
network-attached
storage volumes

Database Versions
11.2, 12.1, 12.2, 18c
and 19c

Customer manages
the OS and Database,
Oracle handles the
infrastructure

For Databases up to
40 TB in size

Supports Real
Application Clusters
and Data Guard

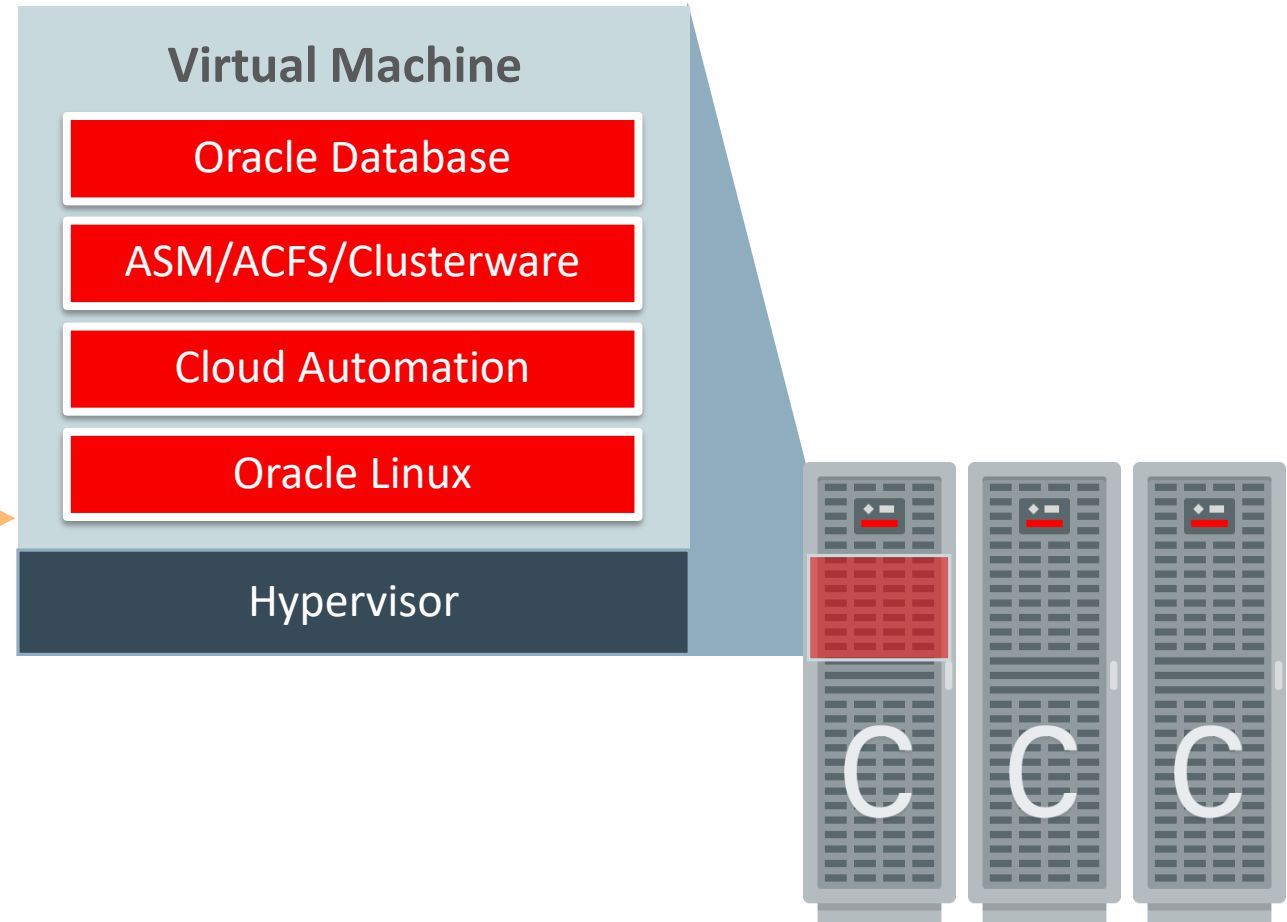
Virtual Machine Database Cloud Service Overview

Virtual Machine

- 2.0 GHz Intel Xeon Platinum 8167M, up to 48 Cores
- 640 GB of RAM Available
- Remote NVMe SSD Block Volumes, up to 40 TB
- Up to 25 GBps (for 24 core or 48 core shapes)
- Oracle Linux



Client Subnet



Virtual Machine Database Cloud Service Overview

Virtual Machine Specs	Virtual Machine Database
CPU, Memory and Storage	CPU: 1 – 24 Memory: 15-320 GB Storage: 0.25 TB – 40 TB
Storage Type	Block
Scaling	Storage Scaling
Backups	Automatic (Incremental) as well as On Demand (Full)
Disaster Recovery	Data Guard
High Availability	2 Node RAC
Patching	User Controlled
Versions	11.2,12.1, 12.2, 18c, 19c
Editions	Standard, Enterprise, High Performance, Extreme Performance Editions
Licensing	BYOL or License Included

Virtual Machine Database | **Key Use Cases**



**Enterprise Applications
(Oracle and 3rd Party)**



Disaster Recovery



**Application
Development**

Bare Metal Database Cloud Service

Bare Metal Database Cloud Service Overview

Intensive Performance

Databases run on real bare-metal servers (not VMs)

Choose from Standard Edition or Enterprise Editions

High Performance Flash Storage is locally attached for best performance

Database Versions 11.2, 12.1, 12.2 and 18c

Customer manages the OS and Database, Oracle handles the infrastructure

For Databases up to 16 TB in size

Supports Data Guard for Disaster Recovery

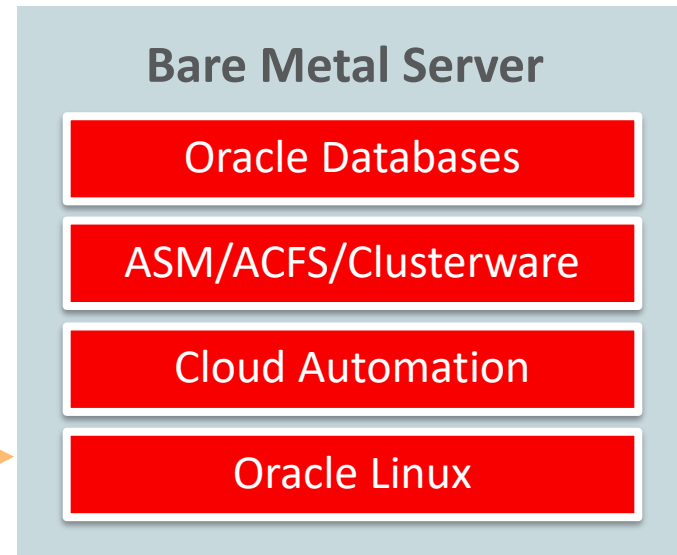
Bare Metal Database Cloud Service Overview

Bare Metal Server (X7)

- 52-Core 2.0 GHz Intel Xeon Platinum 8167M
- 768 GB of Memory
- 8x 6.4 TB NVMe PCIe 3.0 SSD
- 25 Gbps Network
- Oracle Linux



Client Subnet



Bare Metal Database Cloud Service Overview

X7 Bare Metal Specs	Bare Metal Database
CPU, Memory and Storage	CPU: 2 – 52 Memory: 768 GB Storage: 51.2 TB
Storage Type	Locally attached NVMe
Scaling	CPU Scaling
Backups	Automatic (Incremental) as well as On Demand (Full)
Disaster Recovery	Data Guard
High Availability	Cross AD Data Guard
Patching	User Controlled
Versions	11.2,12.1, 12.2, 18c
Editions	Standard, Enterprise, High Performance, Extreme Performance Editions
Licensing	BYOL or License Included

Bare Metal Database | Key Use Cases



**Enterprise Applications
(Oracle and 3rd Party)**



Disaster Recovery



**Application
Development**

Exadata Cloud Service

Exadata Cloud Service Overview

The Fastest, Most Available DB Cloud Platform - Exadata

Complete isolation
with Dedicated
Hardware and
Networking

Multiple Full Oracle
Databases with All
Advanced Options
and different version

Terabytes of Flash and
Storage for
unparalleled
performance

Database Versions
11.2, 12.1, 12.2, 18c
and 19c

Customer manages
the OS and Database,
Oracle handles the
infrastructure

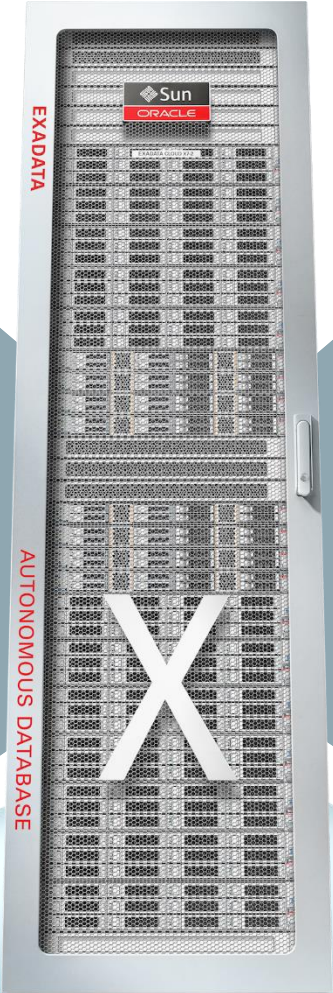
For Databases up to
340 TB in size

Supports Real
Application Clusters
and Data Guard

Exadata Cloud Enterprise Edition Extreme Performance Most Powerful Database + Platform

	Multitenant
	In-Memory DB
	Real Application Clusters
	Active Data Guard
	Partitioning
	Advanced Compression
	Advanced Security, Label Security, DB Vault
	Real Application Testing
	Advanced Analytics, Spatial and Graph
	Management Packs for Oracle Database

All Oracle Database Innovations



All Exadata DB Machine Innovations

Offload SQL to Storage	
InfiniBand Fabric	
Smart Flash Cache, Log	
Storage Indexes	
Columnar Flash Cache	
Hybrid Columnar Compression	
I/O Resource Management	
Network Resource Management	
In-Memory Fault Tolerance	
Exafusion Direct-to-Wire Protocol	

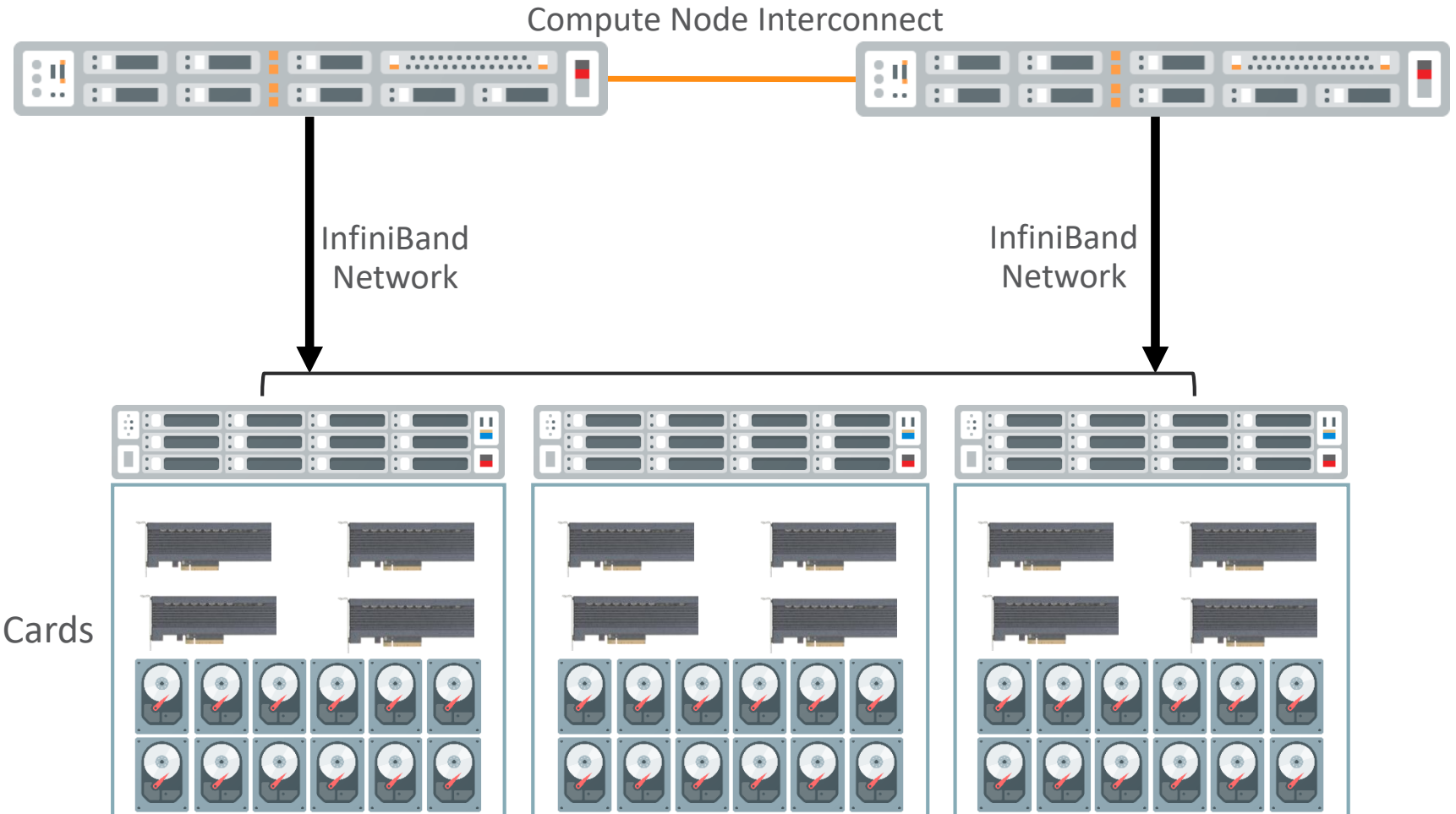


Exadata Cloud Service Architecture Overview

Same Architecture as On-Premises

Exadata Compute Nodes (X7)

- 2x 24-Core Xeon 8160
- 720 GB of Memory
- 25 Gbps Network

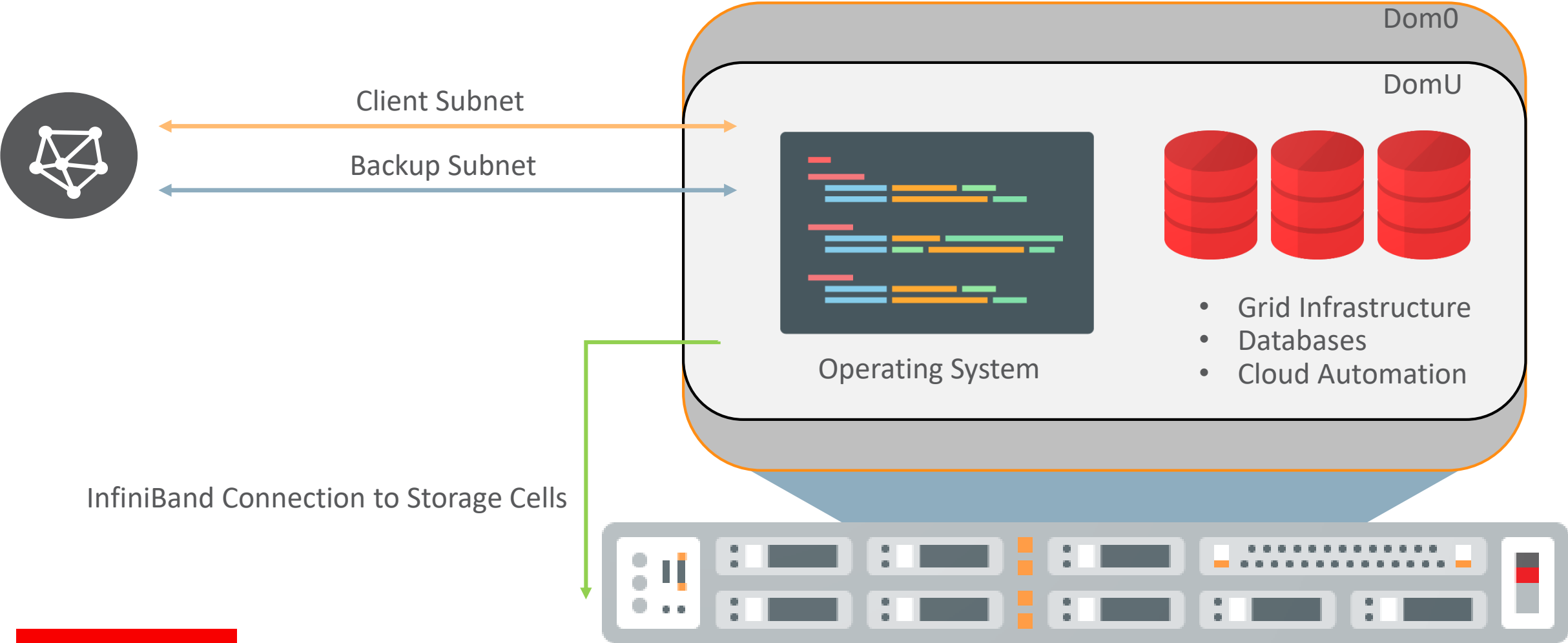


Exadata Storage Cells HC (X7)

- 2x 10-Core Xeon 4114
- 192 GB of Memory
- 4x 6.4 TB NVMe PCIe 3.0 Flash Cards
- 12x 10 TB 7,200 RPM Disks

Exadata Cloud Service Architecture Overview

Same Architecture as On-Premises



Exadata Cloud Service Overview

X7 Exadata Specs	Base	Quarter	Half	Full
CPU and Memory	CPU: 0 – 48 Memory: 720 GB	CPU: 0 – 92 Memory: 1440 GB	CPU: 0 – 184 Memory: 2880 GB	CPU: 0 – 368 Memory: 5760 GB
Compute/Storage Nodes	2/3	2/3	4/6	8/12
Storage Type	Exadata			
Flash Storage	38.4 TB	76.8 TB	153.6 TB	307.2 TB
Max DB Size	59.8 TB	85.5 TB	171.1 TB	342.1 TB
Scaling	CPU Scaling			
High Availability	RAC			
Backups	Automatic (Incremental) as well as On Demand (Full)			
Disaster Recovery	Data Guard			
Patching	User Controlled			
Versions	11.2,12.1, 12.2, 18c Extreme Performance Editions			
Licensing	BYOL or License Included			

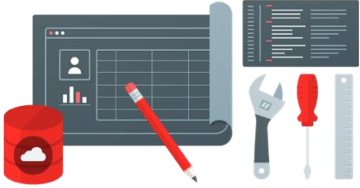
Exadata Cloud Service | Key Use Cases



**Mission Critical
Production
Databases**



**Disaster
Recovery**



**Application
Development**



Consolidation



Analytics

Database Cloud Service Overview

	Virtual Machine	Bare Metal	Exadata
CPU and Memory	CPU: 1 – 24 (48 with RAC) Memory: 15-320 GB	CPU: 2 – 52 Memory: 768 GB	CPU: 0 – 368 Memory: 720-5760 GB
Storage Type	Block	Locally attached NVMe	Exadata
Max DB Size	40 TB	16 TB	342.1 TB
Scaling	Storage Scaling	CPU Scaling	CPU Scaling
High Availability	2 node RAC		Up to 8 node RAC
Backups	Automatic (Incremental) as well as On Demand (Full)		
Disaster Recovery	Data Guard		
Patching	User Controlled		
Versions	11.2,12.1, 12.2, 18c, 19c	11.2,12.1, 12.2, 18c	11.2,12.1, 12.2, 18c, 19c
Database Editions	Standard, Enterprise, High Performance, Extreme Performance Editions		Extreme Performance Edition
Number of DB Instances	One	Multiple	Multiple
Licensing	BYOL or License Included		

Oracle Cloud Infrastructure Region Footprint



Cloud Simplicity: Automated Provisioning, Maintenance, and Elasticity

- Operations are exposed through Web Interfaces, CLIs and RESTful APIs
 - Virtual Network Operations
 - Database and Service Lifecycle Management
 - Database and Grid infrastructure Patching
 - Database Backups
 - Data Guard
 - Service Scaling
- Allows integration with customers' existing automation infrastructure
 - ServiceNow, OpenStack, Cloud Foundry, Terraform
- All operations are controlled by user defined security policies



Database Service Lifecycle Management

- Launch a DB System
 - Create a Database system (VM, BM or ExaCS) via the UI or CLI
 - Choose shape, storage, OCPUs, Subscription Model, Networking and Database Version
- Start, stop, or reboot Compute Nodes
- Add additional SSH Keys
- Scale the Service
- Control IORM for Exadata Services
- Create Additional Databases
- Terminate the Service

Create DB System [Help](#)

1 DB System Information
2 Database Information

Provide basic information for the DB system

Select a compartment
adexacs2 (root)

Name your DB system
DBSystem 201907020813

Select an availability domain

EWVY:UK-LONDON-1-AD-1 EWVY:UK-LONDON-1-AD-1 ✓	EWVY:UK-LONDON-1-AD-2 EWVY:UK-LONDON-1-AD-2	EWVY:UK-LONDON-1-AD-3 EWVY:UK-LONDON-1-AD-3
--	--	--

Select a shape type

Virtual Machine ✓	Bare Metal	Exadata
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Select a Shape

VM.Standard2.1
1 Available Core Count, 1 Node Count [Change Shape](#)



[Next](#) [Cancel](#)

Database and Grid infrastructure Patching

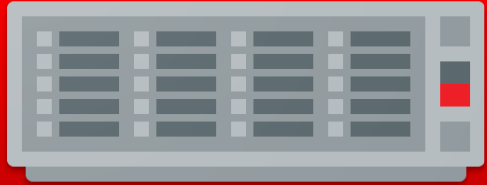
- One Click Patch Automation for Databases and Grid Infrastructure
- Pre-Check and Apply
- Patches are staged automatically when available (Quarterly)
- Patch History available for each database/GI
- Exadata and RAC VM shapes, patches are rolling

Patches

Displaying 2 Database Patches

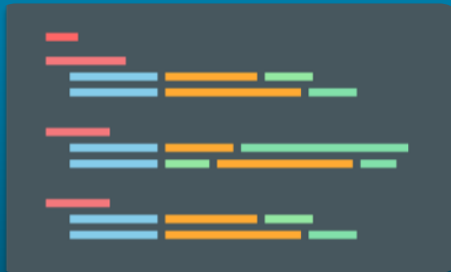
 AVAILABLE	OCID: ...t3wgcq Show Copy Version: 18.6.0.0.190416	Patch Description: Apr 2019 18c Database patch Release Date: Wed, 17 Apr 2019 01:00:00 GMT	⋮
 AVAILABLE	OCID: ...46ffnq Show Copy Version: 18.5.0.0.190115	Patch Description: Jan 2019 18c Database patch Release Date: Wed, 20 Feb 2019 01:00:00 GMT	⋮

Oracle Managed vs Customer Managed



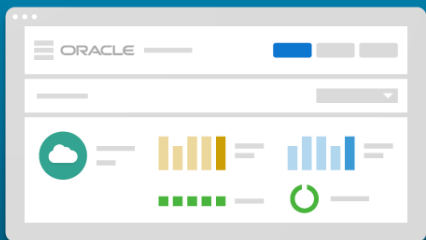
Oracle manages the infrastructure

- Servers, storage cells, storage software, InfiniBand patching, firmware, hypervisor, etc.



Customers control and manage software that directly affects their application

- Authentication to access customer VMs
- Database, Grid Infrastructure, agents, operating system, etc.



Customers configure and run the databases on the service

- Manage database schemas, users, TDE keys (DBA Tasks)
- Invoke Cloud Automation to perform administrative tasks such as updates, backups

Service Scaling

- Scale the Storage on a VM Database Service
- Scale OCPUs on a Bare Metal or Exadata Cloud Service
- No Downtime required, done completely online
- Done via the UI or API
- Use only what you need
 - Start with as many OCPUs as you need to run your day to day workload
 - Scale up or down
 - OCPUs are charged hourly

Scale Up/Down CPU Core Count [help](#) [cancel](#)

CPU CORE COUNT

90

The number of CPU cores to enable on the DB System. Specify a multiple of 2, up to 92.

Scale Up/Down

Availability Domain: EWVY:US-ASHBURN-AD-1
Shape: Exadata.Quarter2.92
Time Zone: UTC
DB System Version: 18.3.0.0.0
CPU Core Count: 92
Disk Redundancy: High
Cluster Name: cl-q4zs5mrq
Port: 1521

OCID: ...zs5mrq [Show](#) [Copy](#)
Created: Mon, 08 Apr 2019 20:25:57 GMT
Compartment: adexacs2 (root)/OOW2018
Oracle Database Software Edition: Enterprise Edition Performance
Virtual Cloud Network: [19test](#)
Client Subnet: Client19
Backup Subnet: Backup19
Hostname Prefix: exacs-0ykrq

High Availability: Database Backup and Recovery

- Enable Automatic Backups for each database
 - On creation or after
- Create a Full Backup at any time that can be used to create additional databases
- Notifications for failed backups
- Restore the database to:
 - Latest Backup
 - A Point in Time
 - An SCN

The screenshot displays the Oracle Cloud console interface for a database backup. At the top, there is a header with the text 'ags'. Below this, a summary box contains the following information: '20190430191759', '19 19:17:59 GMT', 'OCID: ...mepdva Show Copy', 'Database Version: 18.5.0.0.190115', 'Database Unique Name: VM18_jad179', and 'Automatic Backup: Enabled'. Below the summary box, there is a section titled 'Automatic Backup' which shows a table of backup records. The table has columns for 'Backup', 'Started', and 'Ended'. The first row shows a backup with ID 'v2wq', started on 'Wed, 08 May 2019 20:58:28 GMT', and ended on 'Wed, 08 May 2019 21:25:56 GMT'. To the right of the table, there are two buttons: 'Create Database' and 'Delete'. A mouse cursor is hovering over the 'Create Database' button. At the bottom right of the console, there is a three-dot menu icon.

High Availability: Automated Data Guard

- Create Data Guard Instances straight from the console
- Across AD or across Region
- Automatically creates a Standby database from the Primary
- Full Control via the UI
 - Failover
 - Reinststate
 - Switchover

The screenshot displays the Oracle Cloud console interface for managing a Data Guard instance. At the top, there are buttons for 'DB Connection', 'Restore', and 'Apply Tag(s)'. Below this is the 'Database Information' section, which includes fields for Availability Domain, Database Home, Launched time, Database Workload, Character Set, Automatic Backup, DB System, OCID, Database Version, Database Unique Name, Database Role, and National Character Set. The 'Data Guard Associations' section shows a table with one association. The association is in an 'AVAILABLE' state, with a green 'DB' icon. The table includes columns for Peer Database, Peer Role, Peer DB System, Launched time, Protection Mode, Availability Domain, Apply Lag, Apply Rate, and Transport Type. A 'Switchover' button is visible next to the association, along with a 'Reinststate' button and a menu icon.

DB	Peer Database: -	Launched: Thu, 09 May 2019 19:49:06 GMT	Apply Lag: 0 sec
AVAILABLE	Peer Role: Standby	Protection Mode: Maximum Performance	Apply Rate: 6.00
	Peer DB System: -	Availability Domain: EWVY:US-ASHBURN-AD-1	Transport Type: -

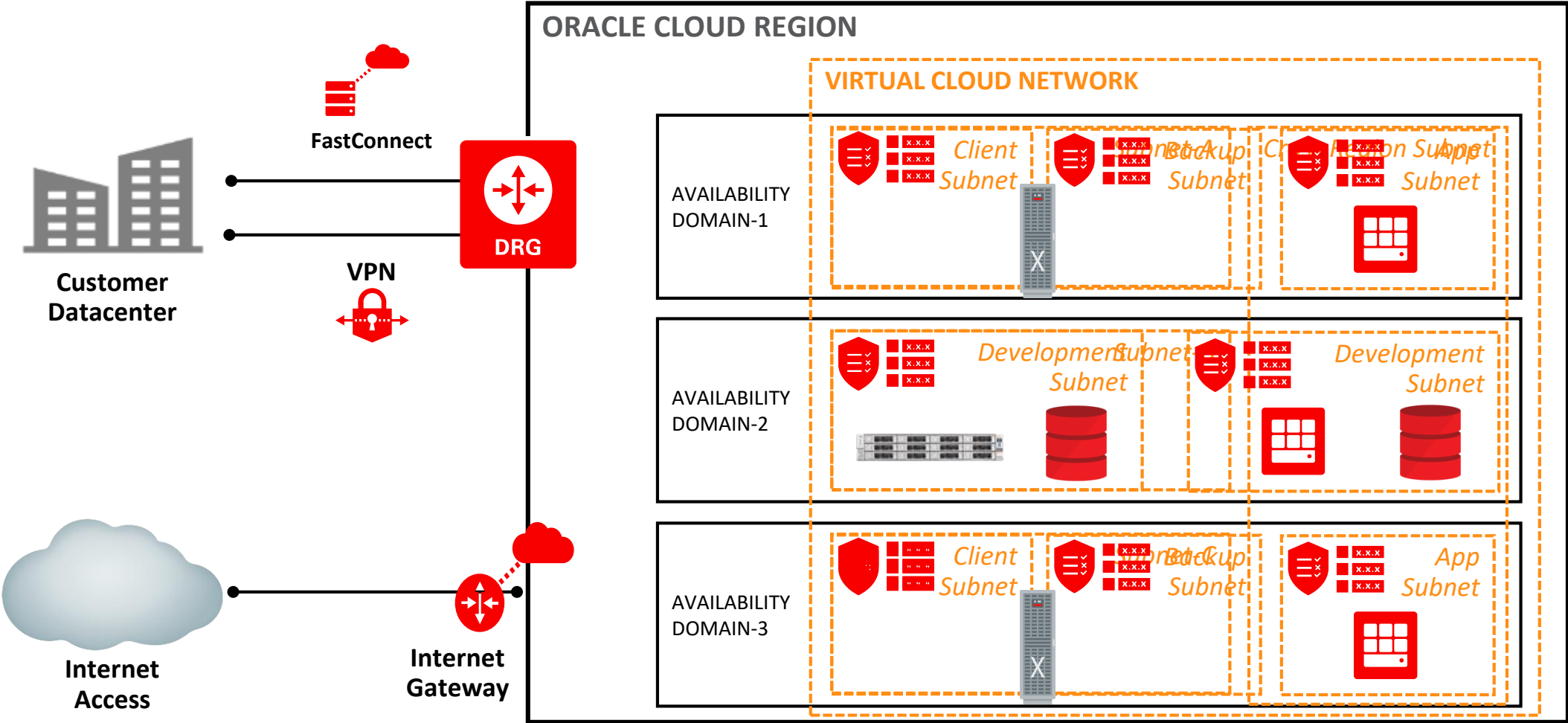
Security First

- All databases created have TDE enabled
- All backups are encrypted
- SQL*Net connections are encrypted to and from the database
- OCI networking isolates the database services – no public IPs
 - Security Lists
 - Routing Rules
- No password based authentication on the OS
- IAM Policy based access



OCI Networking: High-Fidelity Private Networking and Connectivity

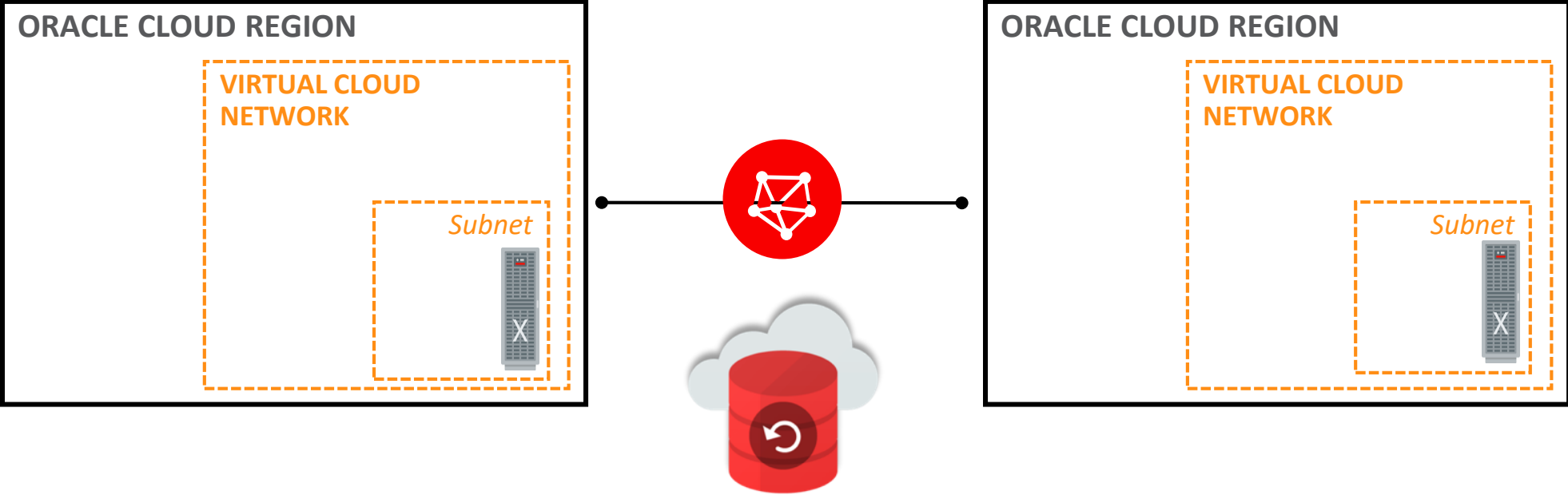
The Public Cloud does not have to be Public



OCI Networking: High-Fidelity Private Networking and Connectivity

Disaster Recovery

Virtual Cloud Network Region Peering over a Private Network



Cross Region Data Guard for Disaster Recovery



Licensing is Different in the Cloud – Bare Metal and VM

Oracle Database License Included

- Choose from
 - Standard Edition, Enterprise Edition
 - Enterprise High Performance and Enterprise Extreme Performance
- *Best for Customers who don't have existing Oracle licenses or want to leverage all the database options*

Bring Your Own License (BYOL) entitlements to the Database Cloud

- Standard or Enterprise Edition, add preferred DB Options currently used on-premises
- Enterprise Edition Licenses include entitlements for the following Oracle Database features
 - Data Masking and Subsetting Pack
 - Diagnostics Pack and Tuning Pack, Real Application Testing
- One Oracle Processor License maps to 2 OCPUs
- All Editions include Oracle Database Transparent Data Encryption.
- *Best for Customers who want to leverage their on-premises investment in Oracle*

Database Editions and Options

Database Edition	Database Options
Database Standard Edition	Includes the Oracle Database Standard Edition Package
Database Enterprise Edition	Includes the Oracle Database Enterprise Edition Package, Data Masking and Subsetting Pack, Diagnostics and Tuning Packs, and Real Application Testing
Database Enterprise Edition High Performance	Extends the Enterprise package with the following options: Multitenant, Partitioning, Advanced Compression, Advanced Security, Label Security, Database Vault, OLAP, Advanced Analytics, Spatial & Graph, Database Lifecycle Management Pack, and Cloud Management Pack for Oracle Database
Database Enterprise Edition Extreme Performance	Extends the High Performance package with the following options: Real Application Clusters (RAC), In-Memory Database, and Active Data Guard

Note that all packages include Oracle Database Transparent Data Encryption (TDE)

Licensing is Different in the Cloud – Exadata Cloud Service

Oracle Database Enterprise Edition Extreme Performance Included

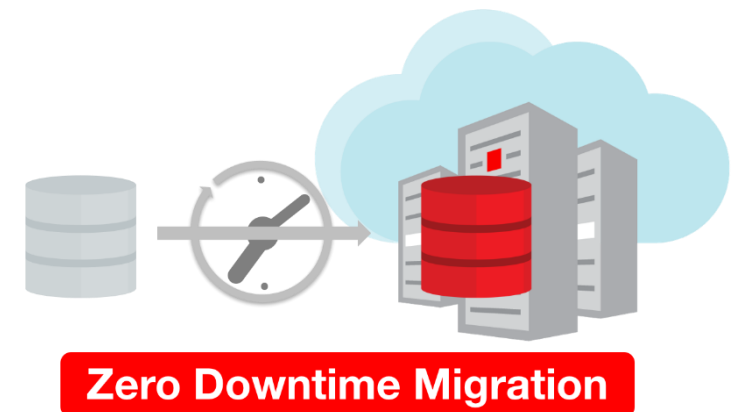
- All Oracle Database Enterprise Edition Options, DB Enterprise Manager Packs
- All Exadata software features included
- *Best for Customers who want to use all the Oracle database options available*

Bring Your Own License (BYOL) entitlements to Exadata Cloud

- Includes DB Enterprise Edition, add preferred DB Options currently used on-premises
- License entitlements for the following Oracle Database features included
 - Transparent Data Encryption (TDE), Data Masking and Subsetting Pack
 - Diagnostics Pack, Tuning Pack, Real Application Testing
- One Oracle Processor License maps to 2 OCPUs
- All Exadata software features included
- *Best for Customers who want to leverage their on-premises investment in Oracle*

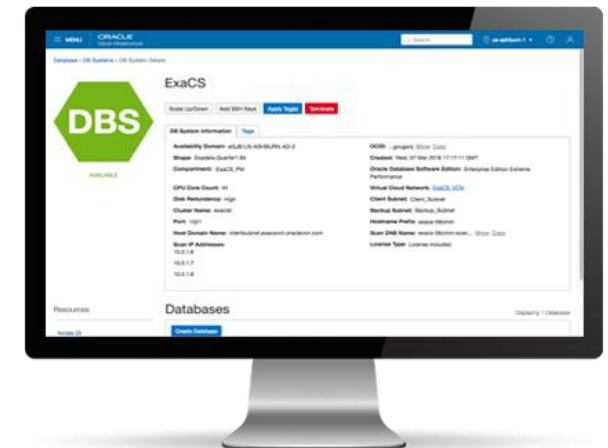
Migrating Databases to the Cloud

- 100% Oracle Database compatibility makes migration easy and low risk
- Oracle Zero Downtime Migration
 - Simple, Automated, One button approach solution for moving your Oracle Databases into the Oracle Cloud
- Create cloud database from on-premises backup
- Data movement options:
 - Use public internet
 - Private high bandwidth virtual network (FastConnect)
 - Data Transfer Services



The Best Database on the Best Cloud Platform

- Choose **Oracle Databases on VMs, Bare Metal, or Exadata, Oracle Cloud** provides the best infrastructure for running your database workload.
- **Cloud simplicity:** automated provisioning, maintenance, and elasticity
- **Built-in high availability and redundancy** provide a trusted platform for running enterprise, mission critical workloads
- **Security first:** encrypted databases, secure communications, and private networks by default
- **Flexible Subscription Options** to meet your Licensing needs
- **100% compatible with your on-premises Oracle workloads** and applications: seamlessly move between the two platforms



Integrated Cloud

Applications & Platform Services